



A banner for Citrix. On the left is a blue book titled 'KEYS TO ACCELERATING WEB APPLICATION DELIVERY'. In the center is a white arrow pointing right with a blue flame-like shape behind it. To the right of the arrow is the text 'Respond now for your free guide to faster WEB application delivery.' On the far right is the Citrix logo.

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Opinion: Edison's Revenge

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October 22, 2007 (Computerworld) Nikola Tesla must be rolling over in his grave. More than 100 years ago, he invented the alternating current network, which trumped Thomas Edison's direct current design to become the standard for electric power distribution networks. AC won because it was more practical. It was the more efficient and economical way to transmit power over long distances. Now the debate has risen anew, and passions are again running high. But this time, the battleground is over which is most energy efficient — and practical — as the distribution network for increasingly power-constrained data centers.

Edison may finally have his revenge. Or will he?

"You'll find people who are religiously convinced in both directions," says John Pflueger, technology strategist at Dell and a board director at The Green Grid consortium. Many of those debates are raging within companies that are building new data center equipment, and The Green Grid is at the center. It launched a power distribution options study, due by year's end, which is investigating seven alternatives. Three of those specify DC voltages.

IT equipment power supplies convert incoming AC power to the various DC voltages the subcomponents require. While some equipment also accepts DC input power, most data centers distribute 208-volt AC out to the racks. At least 10% of the AC power coming into data centers is lost to AC/DC and DC/AC conversion inefficiencies before it reaches the IT equipment. "Every conversion step is maybe 90% efficient on a good day," says HP senior technologist and Green Grid board director Roger Tiple. That wasted energy creates heat that must be removed, increasing air conditioning loads.



An advertisement for Microsoft System Center Data Protection Manager 2007. It features a photo of a man with curly hair, looking thoughtful with his hand on his chin. To the right of the photo, the text reads: 'Microsoft System Center Data Protection Manager 2007', 'Get continuous protection with Microsoft System Center Data Protection Manager.', and 'Get the evaluation version now!'.

DC returned to the forefront with the 2006 release of a paper by Lawrence Berkeley National Laboratory researcher William Tschudi. It showed a 20% overall efficiency gain in the data center by moving to a 380-volt DC power distribution scheme. "Distributing DC would be relatively easy," Tschudi says.

That has some IT executives excited. "We're studying it for a new data center we're looking at building in the next two and a half years," says Bob Culver, senior vice president and manager of technology information group facilities at Wells Fargo. Joseph Hedgecock, senior vice president and head of platform and data centers at Lehman Brothers, says he is also taking a hard look at DC.

"There's a lot of buzz, and a lot of interest in using DC power in the data center," says Peter Gross, CEO at EYP Mission Critical Facilities, which designs data centers.

But DC is far from a slam-dunk. Of the three proposed DC voltages, only the smallest — the -48-volt telco facility standard — is in use today. But such low voltage requires high current, and thus large cables, to deliver the kind of power that large data centers need. The distribution rails required could resemble an overhead train trestle. A proposed 380-volt standard would use lower current and thus smaller conductors. It also exactly matches the uninterruptible power supply's operating voltage, making it very efficient. A proposed 550-volt DC standard would use even smaller cables. But using either 380- or 550-volt DC would require the development of an entirely new infrastructure.

Meanwhile, conversion efficiencies for AC infrastructures have been increasing. American Power Conversion claims 96% efficiency for its newest UPSs, and the latest enterprise-class servers have moved power supply efficiencies from the 70%-to-80% range to over 90%, even when running at low utilization levels.

There still may be efficiency benefits from DC power, but they won't be enough to get DC off the ground. Adopting DC would mean maintaining two power distribution infrastructures, since there will always be equipment in the data center that needs AC. And without a major financial payback, organizations are unlikely to invest the time and money to move into new and uncharted territory.

Even if DC wins the battle for energy-efficiency supremacy, it will still lose the war. Tesla can rest easy.